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PRELIMINARY KEYS TO THE MOSQUITOES OF VIETNAM

By

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First Revision, May, 1966

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PREFACE TO FIRST PRINTING

These keys have been compiled primarily from existing literature, although as far as possible, they have been checked against specimens at the United States National Museum and in some instances characters have been supplied for differentiating closely related species and genera. Inasmuch as the entire mosquito fauna of Southeast Asia is currently undergoing intensive taxonomic investigation, these keys must be recognized as being of a preliminary nature and covering only the species known to occur in Vietnam or presumed to be there on the basis of overall zoogeography. It is hoped that specimens not running satisfactorily in the various keys or that raise any doubts will be submitted to the Army Mosquito Project for examination.

Terminology within the keys has been standardized to conform to that of Belkin (1962, Mosquitoes of the South Pacific (Diptera, Culicidae). Univ. Calif. Press, Berkeley). Figures 1, 2, 3, 4, 5, 16, 17, 18, 19, and 20 have been adapted from the above mentioned publication.

Due to the tentative nature of these keys, they have been reproduced in standard loose-leaf form. As taxonomic and zoo-geographical data accumulate, revisions to the appropriate sections will be made and reproduced in the original format. Revised sections will then be automatically forwarded to individuals known to possess copies of the keys. To this end, it is requested that all individuals receiving copies of these keys forward their name and mailing address to:

Army Mosquito Project
Department of Entomology
Smithsonian Institution
United States National Museum
Washington, D. C. 20560

Attention: File K

Preface to the First Revision

There has been a great demand for the keys and stocks have decreased so rapidly that a reissue came in for consideration. In view of the fact, however, that additional specimens and records have come to hand it was decided to bring the keys up to date and issue this Revision. As a result of demands from workers in the field, for whom the keys are primarily intended, a few extra illustrations have been added and also some notes on medical importance and biology. As before, the Revision is largely based on material in the USNM from Vietnam and adjoining countries plus species recorded in the literature as occurring and those which according to known distribution will probably be found to occur.

It is perhaps advisable to issue a word of warning about the conclusions to be drawn from the Keys. Keys can be good servants but bad masters and they have to be used intelligently and with caution. Like all keys the present one is not the ultimate court of appeal on the identity of a specimen but merely a guide giving a tentative diagnosis until such time as properly identified reference collections and detailed illustrated descriptions are available. SEAMP hopes in time to be able to fulfil both these requirements but it cannot do so until specimens, representative of the whole area, are available for study.

For administrative and other reasons the name of the project has been changed to the South East Asia Mosquito Project (SEAMP). The address remains the same, namely,

South East Asia Mosquito Project (SEAMP)
Department of Entomology
Smithsonian Institution
United States National Museum
Washington, D. C. 20560

The illustrations are by the Department of Entomology, Headquarters 406th Medical Laboratory, United States Army Medical Command, Japan, APO San Francisco 96343 and by Miss Thelma Ford and Miss J. L. Hwang of SEAMP.

Editor, (Botha de Meillon, SEAMP)

LIST OF THE MOSQUITOES OCCURRING, OR LIKELY TO OCCUR, IN THE REPUBLIC OF VIETNAM

Anopheles (Anopheles)

alongensis Venhuis, 1940 annandalei interruptus, Puri, 1929 baezai Gater, 1933 v barbirostris Van der Wulp, 1884 barbumbrosus Strickland and Choudhury, 1927 bengalensis Puri, 1930 campestris Reid, 1962 gigas baileyi Edwards, 1929 ∠ indiensis Theobald, 1901 insulaeflorum (Swellengrebel and Swellengrebel de Graaf), 1920 lesteri Baisas and Hu, 1936 lindesayi Giles, 1900 vnigerrimus Giles, 1900 peditaeniatus (Leicester), 1908 separatus (Leicester), 1908 0 i sinensis Wiedemann, 1828 sintonoides Ho, 1938 umbrosus (Theobald), 1903

crawfordi 7901+7 paradi letifa 177 spec, w, shina
reporter

Anopheles (Cellia)

aconitus Dönitz, 1902 annularis Van der Wulp, 1884 ubalabacensis Baisas, 1936 👭 culicifacies Giles, 1901 fluviatilis James, 1902 jamesii Theobald, 1901 jeyporiensis James, 1902 ^{3 €} jeyporiensis candidiensis Koizumi, 1924 karwari (James), 1903 kochi Donitz, 1901 maculatus Theobald, 1901

minimus Theobald, 1901

Anopheles (Cellia) (cont.)

pallidus Theobald, 1901
philippinensis Ludlow, 1902
ramsayi Covell, 1927
splendidus Koizumi, 1920
subpictus Grassi, 1899
sundaicus (Rodenwaldt), 1925
tessellatus Theobald, 1901
vagus Dönitz, 1902
kuhu

Toxorhynchites (Toxorhynchites)

albipes (Edwards), 1922

/ w kempi (Edwards), 1921

/ ea. csplendens (Wiedemann), 1819

Tripteroides (Tripteroides)

powelli (Ludlow), 1903 proximus (Edwards), 1915 similis (Leicester), 1908

Tripteroides (Rachionotomyia)

aranoides (Theobald), 1901 693 of spin

<u>Malaya</u>

✓genurostris Leicester, 1908 ✓jacobsoni (Edwards), 1930

Topomyia

gracilis Leicester, 1908 / 4 w/shin

Ficalbia (Ficalbia)

Minima (Theobald), 1901 White wany

Ficalbia (Mimomyia)

chamberlaini (Ludlow), 1904 56 Jul. 54 w/sk. hybrida (Leicester), 1908

Ficalbia (Etorleptiomyia)

luzonensis (Ludlow), 1905

Coquillettidia (Coquillettidia)

crassipes (Van der Wulp), 1881 ochracea (Theobald), 1903

Mansonia (Mansonioides)

annulifera (Theobald), 1901 112 sp 11 my show dives (Schiner), 1868

indiana Edwards, 1930 ^{3 €}
 uniformis (Theobald), 1901 ^{3 √/skinic}

Uranotaenia

annandalei Barraud, 1926 bicolor Leicester, 1908 bimaculata Leicester, 1908 campestris Leicester, 1908 edwardsi Barraud, 1926 329 487 hongayi Galliard and Ngu, 1947 V lateralis Ludlow, 1905 46 w/sk L

Uranotaenia (cont.)

luteola Edwards, 1934

lutescens Leicester, 1908

macfarlanei Edwards, 1914

maculipleura Leicester, 1908

maxima Leicester, 1908

obscura Edwards, 1915

recondita Edwards, 1922

Hodgesia

malayi Leicester, 1908

Orthopodomyia

albipes Leicester, 1904 andamanensis Barraud, 1934 anopheloides (Giles), 1903

Aedeomyia

catasticta Knab, 1909 / or

Heizmannia

complex (Theobald), 1910 reidi Mattingly, 1957

Aedes (Mucidus)

laniger (Wiedemann), 1820

Aedes (Ochlerotatus)

vigilax (Skuse), 1889

Togot 59!0 70918 or w/skuns Spherent 39

Aedes (Finlaya)

alongi Galliard and Ngu, 1947

assamensis (Theobald), 1908

chrysolineatus (Theobald), 1907

elsiae (Barraud), 1923

feegradei Barraud, 1934

formosensis Yamada, 1921 gubernatoris (Giles), 1901

khazani Edwards, 1922 18

macfarlanei (Edwards), 1914

niveoides Barraud, 1934 niveus (Ludlow), 1903 liones 5/9

poicilius (Theobald), 1903

prominens (Barraud), 1923

pseudotaeniatus (Giles), 1901

saxicola Edwards, 1922

tonkinensis Galliard and Ngu, 1947

harveyi 1 f w/sk.

Aedes (Skusea)

zamesii (Ludlow), 1903

Aedes (Christophersiomyia)

brayi Knight, 1947

Aedes (Rhinoskusea)

longirostris (Leicester), 1908

Aedes (Stegomyia)

aegypti (Linnaeus), 1762 albolineatus (Theobald), 1904 albopictus (Skuse), 1895

Aedes (Aedimorphus)

alboscutellatus (Theobald), 1905

caecus (Theobald), 1901

mediolineatus (Theobald), 1901

niveoscutellum (Theobald), 1905

taeniorhynchoides (Christophers), 1911

vexans (Meigen), 1830

vigelar 2172

Aedes (Paraedes)

ostentatio (Leicester), 1908

Aedes (Neomelaniconion)

imprimens (Walker), 1861 Tineatopennis (Ludlow), 1905

Aedes (Aedes)

andamanensis Edwards, 1922

Lux Dyar and Shannon, 1925

Aedes (Verrallina)

butleri Theobald, 1901

Armigeres (Armigeres)

aureolineatus (Leicester), 1908
durhami Edwards, 1917
kuchingensis Edwards, 1915
moultoni Edwards, 1914
subalbatus (Coquillett), 1898
dicholicephalas /?

Armigeres (Leicesteria)

vannulitarsis (Leicester), 1908

cingulatus (Leicester), 1908

dolichocephalus (Leicester), 1908

flavus (Leicester), 1908

longipalpis (Leicester), 1904

magnus (Theobald), 1908

pectinatus (Edwards), 1914

Unic. 74 & 5107 m/shmi

Culex (Lutzia)

Y fuscanus Wiedemann, 1820 X halifaxii Theobald, 1903 Y roptor 2 f

Culex (Neoculex)

brevipalpis (Giles), 1902

Culex (Mochthogenes)

foliatus Brug, 1932 khazani Edwards, 1922 malayi (Leicester), 1908

Culex (Lophoceraomyia)

- bernardi (Borel), 1926 cinctellus Edwards, 1922
 - curtipalpis (Edwards), 1914
- × vinfantulus Edwards, 1922
- \times minor (Leicester), 1908
- x minutissimus (Theobald), 1907
- K quadripalpis (Edwards), 1914
- rubithoracis (Leicester), 1908

Culex (Culiciomyia)

fragilis Ludlow, 1903

inigropunctatus Edwards, 1926

pallidothorax Theobald, 1905

viridiventer Giles, 1901 /f/

Culex (Culex) Perplipur 29 w/skns,

vannulus Theobald, 1901

- bitaeniorhynchus Giles, 1901
- fuscocephala Theobald, 1907
- belidus Theobald, 1901 hutchinsoni Barraud, 1924 mimeticus Noe, 1899

mimulus Edwards, 1915

- pipiens quinquefasciatus Say, 1823 pseudosinensis Colless, 1955
- pseudovishnui Colless, 1957
- sinensis Theobald, 1903
- sitiens Wiedemann, 1828
- tritaeniorhynchus (sensu lat.) Giles, 1901
 - vagans Wiedemann, 1828 vishnui Theobald, 1901
 - whitei Barraud, 1923
- whitmorei (Giles), 1904

ample best

sinex 1965 mari

KEY TO GENERA ADULT FEMALES

1.	Posterior margin of scutellum evenly rounded, the marginal setae rather evenly spaced 2
	Posterior margin of scutellum trilobed, the marginal setae in three groups 3
2(1).	Abdominal terga heavily scaled; proboscis with apical half bent sharply downward and backward and conspicuously more slender than basal halfToxorhynchites (p.69) Abdominal terga II-VI with few or no scales; proboscis not sharply bent downward and backward Anopheles (p.15)
3(1).	Spiracular bristles or scales present
4(3).	Proboscis with long hairs; apical part swollen and bent upward (figure 7)
5(4).	Upper calypter without hairs or scales; vein 1A reaching wing margin near level of junction of Cu ₁ and Cu ₂ Topomyia (one species, gracilis) Upper calypter with a fringe of hairs; vein 1A ending well beyond junction of Cu ₁ and Cu ₂ Tripteroides (p.70)
6(3).	Vein 1A short, reaching wing margin before or at about level of junction of Cu ₁ and Cu ₂
7(6).	Dorsal plume scales of wing narrow, forked apically (figure 10); microtrichia present

	Dorsal plume scales not forked; microtrichia absent <u>Uranotaenia</u> (p.77)
8(6).	Middle and hind femur with distinct tufts of scales at apices (figure 8); last two flagellomeres relatively short and thick (figure 9)
	Middle and hind femur without distinct tufts of scales at apices; flagellomeres not short nor thick9
9(8).	Postspiracular bristles absent 10 Postspiracular bristles present 15
10(9).	Postnotum with a median group of setae; anterior pronotal lobes enlarged and nearly touching behind head Heizmannia (p.83)
	Postnotum rarely with a median group of setae; anterior pronotal lobes of normal size and widely separated 11
11(10).	Proboscis more or less distinctly broadened distally, usually bent upwardFicalbia (p.72) Proboscis not broadened distally although the apex may be laterally compressed, usually straight or downcurved12
12(11).	First fore tarsomere longer than the last four combined; fourth tarsomere about as long as wide
	Orthopodomyia (p.82) First fore tarsomere shorter than last four combined; fourth tarsomere longer than wide
13(12).	Claws of hind leg very small and inconspicuous; pulvilli present on all legs (figure 11) Culex (p.33) Claws of hind leg quite large and conspicuous; pulvilli absent
14(13).	Palpus long, nearly half the length of proboscis or more; postspiracular area covered with broad flat scales Armigeres (Leicesteria) (p.84)
	Palpus shorter; postspiracular area bare Coquillettidia (p.74)

15(9).	Dorsal wing scales very numerous, all broad and strongly asymmetrical (figure 12) Mansonia (p.75) Wing scales not unusually broad or if broad not asymmetrical
16(15).	Proboscis somewhat laterally compressed and curved downward (figure 13) Armigeres (Armigeres) (p.84) Proboscis not curved downward, or if slightly so not laterally compressedAedes (p.50)

KEY TO GENERA LARVAE

1.	Siphon not developed
2(1).	Median dorsal valve of siphon very long, fixed, and with serrate dorsal margin (figure 21)
3(2).	Antenna about as long as width of head; anal segment with several multiple hairs midventrallyMansonia (p.75) Antenna very long, at least one and a half times width of head; anal segment with a single hair or none midventrally Coquillettidia (p.74)
4(2).	Siphon with more than one pair of ventrolateral hairs, and sometimes with additional dorsolateral hairs; if these are short and difficult to see, then siphon very long
5(4).	Siphon always with a distinct attached acus at base; prothoracic hair 13-P always absent Culex (p.39) Siphon without acus; prothoracic hair 13-P always developed
6(5).	Metathorax without a prominent spine arising from sclerotized base; prothoracic hairs 5-P and 6-P very large and multiple
7(6).	Sclerotized area at base of each thoracic pleural group of

	setae with spine as long as width of sclerotized area (figure 23)Topomyia (one species, gracilis) Base of each thoracic pleural hair group with spine very much smaller or absent Malaya (p. 71)
8(4).	Abdominal hairs in groups of 3 to 5 on large, common sclerotized plates; mouthbrushes reduced to about 10 broad, flat, simple filaments Toxorhynchites (p. 69) Abdominal hairs arising separately and without strong basal sclerotizations 9
9(8).	Abdominal segments VII and VIII each with a large sclerotized plate covering most of segments; comb of alternating large and small teethOrthopodomyia (p. 82) Abdominal segments VII and VIII not with large sclerotized plates; comb not of alternating large and small teeth
10(9).	Antenna greatly swollen to base of terminal hairs 2-4 Aedeomyia (one species, catasticta) Antenna never greatly swollen and never beyond antennal hair 1
11(10).	Subventral hair of siphon in basal tenth Hodgesia (one species, malayi) * Subventral hair of siphon usually beyond basal third, never in basal tenth
12(11).	Maxillary suture of head capsule at most barely indicated on anterior margin, never reaching posterior tentorial pits
13(12).	Labial plate of head long; head more or less elongate, the antenna shorter than head capsule <u>Uranotaenia</u> (p. 79) Labial plate of head very short; head wide, the antenna always longer than head capsule <u>Ficalbia</u> (p. 72)
only tw	lbia minima would also run down here but differs by having vo simple pecten teeth. Hodgesia malayi has twelve finely d pecten teeth.

14(12).	Siphon without pecten teeth Armigeres (p. 86) Siphon with pecten teeth 15
15(14).	Head hair 5 with at least 3 branches, 4 very large and multibranched with swollen base, 6 usually bifid and with very unequal branches or long and stout, and / or comb often composed of mixed pointed and rounded scales
	Not with this combination of characters Aedes (0.56)

KEY TO ANOPHELES ADULT FEMALES

1.	Wing with three dark areas or less involving both C and R-R ₁ (Subgenus Anopheles)2
	Wing with at least four dark areas involving both C and
	R-R ₁ (Subgenus Cellia)18
2(1).	Wing entirely without pale markings 3
	Wing with pale markings, at least a small apical pale spot on C5
	spot on C
3(2).	Vertical head scales narrow, rod-like (figure 14)
	bengalensis*
	insulaeflorum
	Vertical head scales not unusually narrow4
4(3).	Three to four propleural setae present; palpus markedly
	shorter than proboscis alongensis
	One propleural seta present; palpus and proboscis sub-
	equal sintonoides
5(2).	Hind femur with a prominent tuft of scales at apex
- (-)·	annandalei interruptus
	Hind femur without a tuft at apex6
6(5).	Hind tarsus entirely dark or light only at sutures7
. (- /-	Hind tarsus with white bands8
7(6).	Hind femur entirely dark baezai
1(0).	Hind femur with a broad white band near middle lindesayi
*Anon	heles bengalensis and A. insulaeflorum females cannot be
	ated at present. The males may be identified on the basis of
	cters of the genitalia as follows:
	Tip of phallosome rounded, without spicular processes
	Tip of phallosome acute, with distinct spicular processes
	insulaeflorum

8(6).	Palpus with some white scales 12
9(8).	Abdomen with ventrolateral scale tufts on segment VII 10 Abdomen without ventrolateral scale tufts on segment VII umbrosus
10(9).	Fringe spot at vein R ₄₊₅ wide, reaching to vein M ₁₊₂ barbumbrosus
	Fringe spot at vein R_{4+5} narrow, not reaching to vein M_{1+2} 11
11(10).	More than half the scales between the basal dark spot on vein Cu and the apical dark spot on vein Cu ₂ black————
	Fewer than half these scales blackbarbirostris
12(8).	Basal quarter of vein C almost entirely pale gigas baileyi Basal quarter of vein C mainly dark, although scattered pale scales may be present
13(12).	Abdomen without ventrolateral scale tuft on segment VII separatus
	Abdomen with ventrolateral scale tuft on segment VII14
14(13).	Pale bands on hind tarsus narrow, fourth tarsomere without basal pale band15 Pale bands on hind tarsus moderately broad to very broad,
	fourth tarsomere with basal pale band16
15(14).	Apical fringe spot very short (from R ₁ to R ₂), basal dark mark on Cu fairly long, approaching to within its own length or less than the upper mark on 1A lesteri
	Apical fringe spot longer (from R ₁ to R ₄₊₅ or longer), basal dark mark on Cu shorter, separated by its own length or more from upper dark mark on 1A sinensis
16(14).	Wing pattern bright, basal half of costa with pale scales, basal dark mark on Cu separated by its own length or more from upper dark mark on 1A indiensis

	Wing pattern blurred, darker. Basal dark mark on Cu approaching to within its own length of upper mark on 1A17
17(16).	Third hind tarsal pale band shorter than fifth tarsomere, mid tarsal bands short (figure 15), no pale scales on R ₁ between subcostal and preapical pale spotsnigerrimus
	Third hind tarsal pale band longer than fifth tarsomere, mid-tarsal bands wide; scattered pale scales usually numerous on R ₁ between subcostal and preapical pale spotspeditaeniatus
18(1).	Femora and tibiae speckled with patches of pale scales19 Femora and tibiae not speckled26
19(17).	Hind tarsomeres 5, 4, 3, and apex of 2 all white 20 Hind tarsomeres 5, 4, 3, and apex of 2 not all white 22
20(19).	Palpus with 2 broad apical white bands, palpal segments 2 and 3 speckledsplendidus Palpus with 1 broad apical white band and 1 narrow band, segments 2 and 3 not speckled21
21(20).	Golden scales on abdominal terga VI-VIII jamesii No golden scales on abdominal terga VI-VIIIramsayi
22(19).	Palpus with three or less white bands 23 Palpus with four or more white bands24
23(22).	Palpus with apical and subapical white bands approximately equalmaculatus Palpus with apical white band at least twice the length of the subapical white bandsundaicus
24(22).	Tibio-tarsal joint of hind leg with large conspicuous white bandbalabacensis Tibio-tarsal joint of hind leg without large conspicuous white band

25(24).	Abdominal segments with a row of conspicuous ventro- lateral scale tufts. Palpus with four pale bands and additional indistinct yellowish bands
26(18).	Hind tarsus entirely dark, or with minute pale rings at joints, no longer than wide27. Hind tarsus with distinct white bands, much longer than wide
27(26).	Hind tarsus with minute apical bands of white scales28 Hind tarsus entirely dark, although the sutures may appear light29
28(27).	Apical palpal pale band as long as or shorter than preapical dark bandjeyporiensis jeyporiensis Apical pale palpal band much longer than preapical dark bandjeyporiensis candidiensis
29(27).	Palpus with apical pale band as long as or longer than preapical dark band 30 Palpus with apical pale band shorter than preapical dark band
30(29).	Apical half of proboscis flavescent dorsally; fringe spot at apex of vein 1Aaconitus Apical half of proboscis dark dorsally; no fringe spot at apex of vein 1Aminimus
31(29).	Vein R ₄₊₅ dark for nearly entire length, small white spot near originculicifacies Vein R ₄₊₅ with long white area reaching from middle almost to apex fluviatilis
32(26).	Last hind tarsomere entirely white 33 Last hind tarsomere not entirely white36
33(32).	Hind tarsomere 4 entirely white34

	Hind tarsomere 4 with central dark band karwari
34(33).	Vein Cu1 with a dark area at baseannularis Vein Cu1 with a pale area at base35
35(34).	Abdomen without pale scales, or with a few pale scales on apical segments philippinensis Abdomen with numerous scattered pale scales on most segmentspallidus
36(32).	Apical pale band of palpus at best three times longer than preapical dark band. Proboscis with pale spot toward extremity. Presector dark spot on vein R ₁ usually less than half as long as that on C, sometimes absentvagus Apical pale band of palpus not more than two and one-half times as long as preapical dark band. Proboscis uniformly dark. Presector dark spot on vein R ₁ usually more than half the length of that on vein Csubpictus

KEY TO ANOPHELES LARVAE

1.	Distance between the bases of head hairs 2 not more, usually much less, than the distance between head hairs 2 and 3 on one side (A. alongensis is an exception, but head hairs 5, 6, and 7 are all very small, the tips well behind base of head hair 4) (Subgenus Anopheles)2
	Distance between the bases of head hairs 2 much more than the distance between the bases of head hairs 2 and 3 on one side; head hairs 5, 6, and 7 reaching almost to or beyond base of head hair 4 (Subgenus Cellia)19
2(1).	Antennal hair 1 arising from the dorso-external surface of the antenna3 Antennal hair 1 arising from the dorso-internal surface of the antenna5
3(2).	Head hairs 5, 6, and 7 all short, poorly developed, and sparsely branched 4 Head hair 5 fairly long, simple, or split at outer 2/3 annandalei interruptus
4(3).	Integument covered dorsally with numerous spicules and setaesintonoides Integument smooth, without conspicuous spicules alongensis
5(2).	Antennal hair 1 arising from dorsal surface on basal 1/3 of antenna
6(5).	Distance between bases of head hairs 2 about the same as between head hairs 2 and 3 on one side bengalensis Bases of head hairs 2 close together, nearly touching7
7(6).	Abdominal hair 1-I palmate insulaeflorum

	Abdominal hair 1-1 not paimate8
8(7).	Abdominal hair 1-II palmatelindesayi Abdominal hair 1-II not palmategigas baileyi
9(5).	Abdominal hair 1 palmate on five or more segments10 Abdominal hair 1 palmate on three or fewer segments17
10(9).	Thoracic hair 1-P with branches arising from near base11 Thoracic hair 1-P simple or with a few short branches near tip
11(10).	Head hair 3 with branches stiff, crowded, and forming a broom-like tuft
12(11).	Difference between the sum of the branches on both abdominal hairs 13-III and the sum of the branches on both hairs 5-VII is ten or less
13(10).	Thoracic hair 4-M small, with horizontally spreading branches peditaeniatus Thoracic hair 4-M not small, the branches straight, stiff, and erect
14(13).	Palmate hairs large, leaflets pale basally and at tips; spiracles large
15(14).	Head hair 8 with thirteen or fewer branches; abdominal hairs 5-VI and 9-VI with six to eleven branches-sinensis Head hair 8 with more than thirteen branches; abdominal hairs 5-VI and 9-VI with two to five branches nigerrimus
16(14).	Head hair 8 with eleven or more branches; pecten with six

	or fewer long teethindiensis Head hair 8 with less than eleven branches; pecten with seven or more long teethlesteri
17(9).	Abdominal hair 1 palmate on at least segments IV and Vumbrosus Abdomen without palmate hairs18
18(17).	Tips of head hair 3 frayed into fine branches. Antennal hair 1 with 13-21 branchesbaezai Head hair 3 simple, antennal hair 1 with 25-36 branchesseparatus
19(1).	Anterior tergal plates on abdominal segments III-VII large, enclosing small posterior plate20 Anterior tergal plates on abdominal segments III-VII small, not enclosing small posterior plate22
20(19).	Head hairs 2 and 3 pectinate aconitus Head hairs 2 and 3 simple 21
21(20).	Abdominal hairs 0 on IV-VII very small, few or no branches minimus Abdominal hair 0 on IV-VII moderate in size, many branches fluviatilis
22(19).	Head hair 3 with long brush-like branches, often as long as hair itself
23(22).	Head hair 8 simple or bifurcate near tip 24 Head hair 8 split near base into two to eight branches25
24(23).	Abdominal hair 1-I distinctly palmateannularis Abdominal hair 1-I not distinctly palmatejamesii
25(23).	Head hair 4 with two to five branches; palmate hairs with

	filaments 1/2 or more the length of blade pallidus Head hair 4 with seven to ten branches; palmate hairs with filaments about 1/4 the length of bladephilippinensis
26(22).	Head hair 3 simple or only inconspicuously frayed 27 Head hair 3 pectinate 34
27(26).	Abdominal hair 1-I with distinct sharp, flattened leaflets
	Abdominal hair 1-I with branches filamentous or blunt 31
28(27).	Both thoracic hairs 9-T and 10-T pectinate29 Thoracic hairs 9-T and 10-T with one pectinate, the other simpleculicifacies
29(28).	Head hair 3 about 1/3 length of head hair 2; base of head hair 4 distinctly internal to base of hair 3vagus Head hair 3 1/2 or more the length of head hair 2; base of head hair 4 not internal to base of hair 330
30(29).	Spiracular lobe hair 1 with four to six branches; thoracic hair 4-M simple or bifurcate in distal 1/2 subpictus Spiracular lobe hair 1 with seven to eight branches; thoracic hair 4-M split in basal 1/2 into two to four branches sundaicus
31(27).	Abdominal hair 1-II palmate 32 Abdominal hair 1-II not palmate 33
32(31).	Some of the pro- and mesothoracic hairs 9 and 10 feathered
33(31).	Thoracic hair 1-P with more than four branches; arising from a large conspicuous base with an apical tooth-like processbalabacensis Thoracic hair 1-P with two to four branches; arising from an inconspicuous basetessellatus

34(26).	Both thoracic hairs 9-T and 10-T feathered35 Neither thoracic hair 9-T nor 10-T feathered37
35(34).	The shortest of thoracic hairs 9-P, 10-P, 11-P, and 12-P stout, truncate, with a number of lateral spine-like branchesramsayi The shortest of thoracic hairs 9-P, 10-P, 11-P, and 12-P not stout nor truncate, splits distally into two to four branches
36(35).	Head hair 8 with two to four branches from near base splendidus
	Head hair 8 simple or bifurcate apicallykarwari
37(34).	Head hair 2 with a large number of branches along the whole lengthjeyporiensis jeyporiensis Head hair 2 with a few stout branches jeyporiensis candidiensis

Species	
Anopheles	•
Habitats of	
arval	

									2 5
	Artificial Containers					+			
	Nipah Swamp on Coast				+				
	Footprint, Hoofprint					+			+
	Wells, Barrow Pits					+			+
	Springs, Seepages							+	
Species	Brackish Water Ponds				+				
eles Sp	Marshes, Swamps					+			+
noph	Tree Hole			+					
of A	Коск Ноје		+				+	+	
abitats	Mountain Streams, Waterfalla						+	+	
Larval Habitats of Anopheles	Surface Pools,					+	*		+
La	Streams, Irrigation Ditches					+	+	+	+
	Rice Paddy					*	+		#
		pheles)	sis	nandalei interruptus		stris	orosus	ısis	tris
		nopheles (Anopheles)	alongensis	annandalei interru	baezai	barbirostris	barbumbrosus	bengalensis	campestris
		-							

	S	Container										
		dur	bsh Swa Coast									+
			otprint, ofprint			+		+				
		sti	ells, rrow Pi					+				
			rings, epages		+		+					
cies		Vater	sckish <i>I</i> nds									+
Larval Habitats of Anopheles Species			smps rspes,							+	+	+ .
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of An			ск ңоје	оя	+ .		+					
oitats c		treams,	2 nistan 2 nistan 3		+		+		+		+	
val Ha		'slo	face Po nds	ı		+			. *	+	+	+
Laı		Ditches	eams, igation			+	+	+	+	+	+	
		1	e P addy	Ric		+		#		*	#	
					uileyi	α	lorum		'n	nus	niatus	sn
•				1. 7.	gigas baileyi	inclensis	insulaeflorum	lesteri	lindesayi	nigerrimus	peditaeniatus	separatus
					* *							

Species
pheles
of Anop
Habitats
Larval

	Hoofprint Wamp on Coast Containers Artificial Containers					+		+	+	27
	Barrow Pits Footprint			·		+	+	т	+	1.
	Springs, Seepages Wells,					Т	т		т	+
pecies	Brackish Water Ponds									
eles S _I	Marshes, Swamps	+				+		+		
Anoph	Tree Hole		(+)				+			
s of 7	Коск Ноје						•			
Habitats of Anopheles Species	Mountain Streams, Waterfalls			+				+		
Larval I	Surface Pools, Ponds	+		+		+	+		+	+
H	Streams, Irrigation Ditches	+				+	+		#	*
	Rice Paddy	#				*	+		+	+
		sinensis	sintonoides	umbrosus	Anopheles (Cellia)	aconitus	annularis	balabacensis	culicifacies	fluviatilis

Artificial Containers

		Lar	val Ha	Larval Habitats of Anopheles Species	of Anc	phel	es Spe	cies				•
	Rice Paddy	Streams, Irrigation Ditches	Surface Pools,	Mountain Streams, Waterfalls	Воск Ноје	Tree Hole	Marshes, Swamps	Brackish Water Ponds	Springs, Seepages	Wells, Barrow Pits	Footprint, Hoofprint	Wipah Swamp on Coast
jamesii			+						+	+		
jeyporiensis	+	+	+	+			+		+			
jeyporiensis candidiensis	+	+	+	+			+		+			
karwari		+	+	+					+			
kochi	+	+	#				+				+	
maculatus		+		#	+				+			
minimus	+	#	+	+					+			
pallidus	*	+	+								+	
philippinensis	*	+	+		+					+		

	Nipah Swamp on Coast Artificial Containers			+	+		+	
	Footprint, Hoofprint			+	+	, +	+	
	Wells, Barrow Pits	+	+	+	+	+	+	
	Springs, Seepages		+	+		+		
Species	Brackish Water Ponds			+	+			
les Spe	Marshes, Swamps	+		+		+	+	
ophe	Tree Hole							
of Ar	Коск Ноле						+	
Larval Habitats of Anopheles	Mountain Streams, Waterfalls							
val Ha	Surface Pools, Ponds	+		#		+	+	
La	Streams, Irrigation Ditches		+	+		+	#	
	Rice Paddy			+		#	+	
		ramsayi	splendidus	subpictus	sundaicus	tessellatus	vagus	
	·	۲	00	Ø	Ø	تب	>	

- Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia. # Particularly favored larval habitat. (+) Only larval habitat known.

Anopheles Vectors of Malaria

A number of species of Anopheles have been implicated in the transmission of malaria in Vietnam, but much remains to be learned on this subject. Many of the older records refer only to Tonkin, now in North Vietnam. Also, many of the older records are difficult to evaluate because of the failure of the earlier workers to recognize the existence of species groups among the Anopheles they examined for malaria parasites. It is essential that the vector status of the Anopheles species now recognized in the Republic of Vietnam be determined as rapidly as possible, in as many types of habitat and terrain as possible. This can be accomplished best by dissection of female mosquitoes biting man and examination of their mid-guts and salivary glands for malaria parasites. The possible presence of non-human malaria in Vietnam and its transmission by anophelines must be remembered.

Three species are generally recognized as malaria vectors in Vietnam: Anopheles sundaicus, minimus and jeyporiensis. A number of other species have been found infected from time to time, but their importance is open to question, since almost any Anopheles species may occasionally be found infected in an endemic area if enough individuals are examined. Several species, however, are vectors in neighboring areas and may prove to be quite important in Vietnam when additional data become available. Chief among these is Anopheles balabacensis, a potent jungle vector of malaria elsewhere in South East Asia. Of somewhat less probable importance are Anopheles maculatus and A. sinensis. Some notes on the habits and distribution of these species are given below:

Anopheles minimus - This strongly anthropophilic species is an important vector of malaria in foothill agricultural areas in many countries in South East Asia. The larvae are generally found in irrigation ditches and similar habitats partially open to the sun. In unsprayed areas the females feed primarily indoors and rest in houses. In sprayed areas they may bite more freely outdoors and

also tend to rest in the vegetation. Man is the preferred host, but domestic animals are also attacked, especially in sprayed areas.

Anopheles jeyporiensis candidiensis - The larvae of this foothill and mountain species are found in similar habitats to those of An. minimus. The adults also attack man indoors, or out of doors in sprayed areas.

Anopheles sundaicus - Strictly a coastal species. The larvae are found in pools of brackish water with emergent vegetation, often in association with the larvae of An. subpictus, which they resemble very closely. The transitory nature of the larval habitats and the strong flight habits of the adults combine to make population levels of this species fluctuate markedly. This is also true of the level of malaria in the populations in coastal areas where this species is the vector. They are extremely voracious feeders on man chiefly indoors, and on domestic animals.

Anopheles balabacensis - The importance of this species as a malaria vector in South East Asia has become increasingly clear in recent years. It is characteristic of the primary forest, or marginal recently cleared areas. The larvae are found in footprints or small pools in the jungle and similar habitats. The adults feed preferentially on man and other primates, usually outdoors, but they will also enter houses to feed. The species may occur in coastal areas where forest covered hills approach the shore, but it is more typical of upland hill forest.

Anopheles sinensis - Has been implicated as a malaria vector in delta or lowland rice growing areas of South East Asia. Most malaria transmission in South East Asia is either associated with foothill or mountainous areas, or with the coastal strip. However, a small number of cases, with sporadic epidemics, are found in the rice-growing regions. An. sinensis is suspected in such areas

and positive dissections have been reported in Vietnam. However, several other species have been confused under this name in the past (nigerrimus, peditaeniatus, lesteri and others) and it is impossible to evaluate the situation at present. Members of the species complex feed primarily on domestic animals, but may attack man heavily at times. The larvae are found most abundantly in rice fields, particularly after the ripening of the grain when water surfaces and vegetation are at their maxima.

KEY TO CULEX ADULT FEMALES

1.	Proboscis completely dark scaled2 Proboscis ringed with a median band of pale scales3
2(1).	Acrostichal bristles well developed on the mesonotum (figure 4)3 Acrostichal bristles not developed except at extreme anterior end and rarely weakly near prescutellar space
3(1, 2).	From one to several lower mesepimeral bristles present (figure 2)4
	No differentiated lower mesepimeral bristles; at most a few to numerous short hairs at the middle mesepimeron
4(3).	Four or more lower mesepimeral bristles present; proboscis with a broad band of white scales (Lutzia)5 Three or less lower mesepimeral bristles present; proboscis unbanded
5(4).	Abdominal terga V through VIII entirely yellow scaled, or with very broad apical bands; terga II through IV entirely dark, or with very narrow apical bands (Lutzia) fuscanus
	Abdominal terga entirely dark, or all with pale apical bands of approximately the same width halifaxii
6(4).	Pleuron with distinct scale patches at least on upper and lower sternopleuron and middle mesepimeron (figure 3) (Culex in part)7 Pleuron without distinct scale patches
7(6).	Abdominal terga unbanded (Culex) fuscocephala Abdominal terga with narrow, basal white bands8

8(7).	longitudinal stripe of white scales (in the mid-femur this stripe is central and bounded on either side by dark scales; in the hind-femur this stripe completely covers the lower half)
9(8).	Integument of pleuron with bare, blackish-brown areas present hutchinsoni
	Integument of pleuron generally uniformly colored pipiens quinquefasciatus
10(6).	Integument of pleuron with a dark spot occupying the larger part of the mesepimeron (figure 2) (Mochthogenes) khazani
	Integument of pleuron with a dark spot only across upper part of mesepimeron 11
11(10).	Decumbent scales of the occiput usually uniformly dark; anterior surface of hind femur pale; abdominal sterna dark
12(3).	Proboscis entirely dark scaled (Neoculex) brevipalpis Proboscis with a distinct median pale band (Culex in part)13
13(12).	Wing with two or more distinct patches of light scales on the costa and subcosta
14(13).	First pale costal spot (at middle of wing) extending only on to subcosta(Culex) mimeticus

	First pale costal spot extending over vein Rmimulus
15(13).	Abdominal terga with white apical bands, with apical, lateral triangular patches and basal bands, or with several segments completely covered with pale scales
	Abdominal terga with white basal bands; apical bands or patches not present, or at least not visible from above
16(15).	Wing generally with numerous scattered pale scales; mesonotum without a distinct pattern of silvery scalesbitaeniorhynchus Wing with few or no pale scales; mesonotum with a distinct pattern of silvery scales
17(16).	Apical pale abdominal bands with a straight anterior border; basal abdominal bands very narrow sinensis Apical pale abdominal bands represented on the proximal terga by triangular lateral patches which may merge in the center; basal abdominal bands rather broad pseudosinensis
18(15).	Mesonotum covered with a distinct, dense pattern of silver scales
19(18).	alar area, the prescutellar area and scutellar lobes dark; basal abdominal bands reaching to the lateral edges of the tergagelidus Mesonotal silver scaling continued posteriorly through the prescutellar space and onto the scutellum; basal ab-
	dominal bands not reaching to the lateral edges of the terga and with a prominent median expansion whitmorei

20(18).	Anterior surface of hind femur with a broad, dark subapical band which extends basally to form a dark stripe along its dorsal border (figure 27); vertex with numerous pale, gold upright forked scales over the central area, and with a few dark ones posterolaterallypseudovishnui Anterior surface of hind femur unicolorous, speckled with dark and light scales, or with a narrow, dark subapical band; vertex with dull brown, upright forked scales, or if golden, without dark scales posterolaterally
21(20).	Proboscis with accessory pale patches on the ventral surface (figure 28); a small dark-brown species* tritaeniorhynchus (sensu lat.) Proboscis without accessory pale patches on the ventral
	surface 22
22(21).	Mid femur unicolorous; mid tibia without a trace of a longitudinal stripe annulus Mid femur speckled with brown and white scales; mid tibia black with a trace of light scales forming somewhat of a longitudinal stripe
23(22).	Upright forked scales on occiput all brownsitiens Upright forked scales on occiput creamy white medially and with several dark scales posterolaterallywhitei
24(2).	Mesonotal scaling very dense, smooth in appearance; proboscis fairly thick (Culiciomyia) 25

^{*}Some specimens from a laboratory colony have been studied in which the accessory pale patches are enlarged, covering the entire ventral surface of the proboscis basad of the median pale band. Others from the same colony exhibited the condition normally seen in wild caught specimens.

	Mesonotal scaling sparse, rough in appearance; proboscis fairly thin (Lophoceraomyia)*
25(24).	Abdominal terga entirely dark; pleuron uniform in color (Culiciomyia) fragilis Abdominal terga with pale bands; integument of pleuron with dark markings 26
26(25).	Pleuron pale, with a distinct black spot on upper part of mesepimeronnigropunctatus Pleuron with a brown stripe across upper part pallidothorax

Culex (Culex) vishnui, Culex (Lophoceraomyia) bernardi, Culex (Lophoceraomyia) minutissimus, and Culex (Culiciomyia) viridiventer are not included in the key because of lack of suitable material.

*Separation of species based on females of the subgenus Lophoceraomyia is not reliable at the present time. The following diagnostic adult characters for species in the subgenus apply only to the male.

2(1).	Apex of distimere noticeably expanded; basimere without long prominent submarginal setae curtipalpis Apex of distimere evenly tapered; basimere with long prominent submarginal setaeminor
3(1).	Abdominal terga with well marked basal white bands; basimere with the prominent submarginal setae in a patchcinctellus. Abdominal terga without white bands; basimere with the prominent submarginal setae in a line
4(3).	Outer division of the phallosome with reticular markings on the entire surface; submarginal setae fine; flagellomeres 6 and 7 without tufts of scales or specialized setaeinfantulus Outer division of phallosome smooth; submarginal setae prominent; flagellomeres 6 and 7 with tufts of scales
5(4).	Mesonotal integument often with a reddish tint; lower mesepimeral bristle absent; flagellomere 6 with a rather inconspicuous tuft of narrow, tapering, pointed scales rubithoracis Mesonotal integument not as above; lower mesepimeral bristle present; flagellomere 6 with a conspicuous
	tuft of broad scales quadripalpis

KEY TO CULEX LARVAE

1.	Labrum produced in front; mouthbrushes thickened, inserted in a compact group (figure 24); pecten
	extending nearly the length of the siphon
	(Lutzia) fuscanus
	halifaxii
	Labrum not usually produced in front; mouthbrushes
	normal; pecten restricted to the basal half of the
	siphon or less2
	siphon of less
2(1).	Ventral brush consisting of eight hair tufts inserted on the grid; head hair 1 fine and filamentous and thoracic hair 3-P much thinner than 1-P and usually about half
	its length or if head hair 1 stout, thoracic hairs 1-P
	bifid and 3-P with two or more branches
	(<u>Culiciomyia</u>) 3
	Ventral brush consisting of ten or more hair tufts inserted on the grid; head hair 1 generally robust and tapering gradually to a bluntly rounded point; if head hair 1 is filamentous, then thoracic hairs 1-P and 3-P single and of the same order of magnitude and thickness
- (2)	
3(2).	Siphon with a "false joint" beyond the middle due to lack of sclerotization in an irregular ring
	(Culiciomyia) nigropunctatus
	Siphon without a "false joint" beyond the middle
4(3).	Head hair 5-C seven branched, 6-C eight branched
• •	fragilis
	Head hairs 5-C and 6-C three or four branched 5
5(4).	Siphonal index approximately 4:1; siphon greatly enlarged medially; less than ten pecten teethpallidothorax Siphonal index 5:1 or greater; siphon moderately enlarged medially; more than ten pecten teethviridiventer
	industry, indication poor poor in the indication

6(2).	Individual pecten teeth fringed with many fine, parallel, closely placed denticles distally and a few coarse widely spaced denticles basally (Mochthogenes)7 Individual pecten teeth without two distinct types of denticles as indicated above9
7(6).	All comb scales fan shaped, fringed with subequal spicules (Mochthogenes) foliatus Anterior comb scales fan shaped, posterior comb scales with the median distal enlarged8
8(7).	Posterior comb scales elongated, the apical median spine at least five times as long and broad as the weak lateral spines malayi Posterior comb scales short, fringed with spines and with the apical median spine about twice as wide and long as the lateral spineskhazani
9(6).	Thoracic hair 3-P single, of the same order of magnitude and thickness as 1-P (Culex)
10(9).	Head hair 1-C tapering rapidly to a filamentous, extended, sharp point
11(10).	Siphonal index approximately 3:1; individual siphonal tufts generally four-branched
12(11).	Siphonal index approximately 7:1; individual siphon tufts very short (less than half the width of the siphon at the point of insertion); head hairs 5, 6-C bifid fuscocephala

	Siphonal index approximately 5:1; individual siphon tufts long; head hair 5-C six-branched, 6-C four-branched vagans
13(10).	Siphon with a strong, distinct subapical spine hutchinsoni Siphon without a subapical spine14
14(13).	Head hair 1-C lightly pigmented, long, cylindrical; pecten inconspicuous, restricted to the basal 1/5 of the siphon or less
15(14).	Distance between head hairs 1-C greater than the length of one of the hairs; lateral teeth of the mentum robust, distinctly separatedsinensis Distance between head hairs 1-C less than the length of one of the hairs; lateral teeth of mentum extremely narrow and compact
16(15).	Individual comb scales elongated (length approximately eight times greater than the basal width); pecten consisting of approximately five to ten teethbitaeniorhynchus Individual comb scales relatively short (length approximately three times greater than the basal width); pecten consisting of approximately ten to twelve teeth
17(14).	Comb consisting of approximately fifteen or less scales 18 Comb consisting of approximately twenty or more scales 19
18(17).	Siphonal index not more than 4:1; all siphonal tufts two branched, some pectinate whitmorei Siphonal index not less than 5:1; siphonal tufts two to four branched, simple pseudovishnui
19(17).	Siphonal tufts inserted in a line on the siphongelidus

	One or more pairs of siphonal tufts inserted out of line on the siphon20
20(19).	Head hair 1 flattened, broad, its apex rounded or irregular; anal gills bulbous, not as long as the anal saddle sitiens
	Head hair 1 slender or moderately thickened, its apex acuminate; anal gills elongate, at least as long as the anal saddle21
21(20).	At least some of the individual comb scales with the median distal spine somewhat longer and broader than the lateral spicules 22
	Individual comb scales fan-shaped, fringed with subequal spicules 24
22(21).	Thoracic hair 4-P single; subventral siphonal hairs in irregular pairs or in a zigzag row mimeticus
	Thoracic hair 4-P double; subventral siphonal hairs in regular pairs 23
23(22).	Individual siphonal tufts two to four branched; the length of the individual siphonal tufts less than the width of the siphon at the point of insertion; thorax glabrouswhitei
	Individual siphonal tufts multiple; the length of the individual siphonal tufts greater than the width of the siphon at the point of insertion; thorax minutely spiculoseannulus
24(21).	Thoracic hair 4-P double; thoracic hair 2-M dendritic; head hair 4-C usually single, simple
	Thoracic hair 4-P single; thoracic hair 2-M single, simple; head hair 4-C usually double, simple mimulus
25(9).	Head hairs 16-C and 17-C absent26 Head hairs 16-C and 17-C developed as rather long, slender spicules (Lophoceraomyia in part)27

26(25).	Siphon index ranging from 7:1 to 15:1; antennal tuft (hair 1) multiple, the antennal shaft constricted beyond the insertion of the tuft (Neoculex) brevipalpis Siphon very short, its length less than that of the saddle; antennal tuft small, consisting of 2 or 3 branches, the antennal shaft not constricted beyond the insertion of the tuft (Lophoceraomyia) curtipalpis
27(25).	Head hairs 4-C very long, distinctly longer than the distance between their bases; hair 2 of abdominal segment VIII single minor Head hairs 4-C relatively short, shorter than the distance between their bases; hair 2 of abdominal segment VIII bifid (except in C. infantulus)
28(27).	Head hairs 5, 6-C generally with four to eight branches cinctellus Head hairs 5, 6-C generally with three or less branches 29
29(28).	Thoracic integument spiculose; thoracic hair 3-P multiplerubithoracis Thoracic integument glabrous; thoracic hair 3-P single or double30
30(29).	Thoracic hair 4-P single quadripalpis Thoracic hair 4-P branched31
31(30).	Siphon generally with a well marked dark median band which is as dark as the basal ring minutissimus Siphon usually either without a band or with a faintly visible median band which is paler than the basal ringinfantulus

<u>Culex (Culex) vishnui</u> and <u>Culex (Lophoceraomyia) bernardi</u> are not included in the key because of lack of suitable material.

	Polluted Catchments		*	#						
	Bamboo Internodes,					+		+		
	, sinirqioo T sinirqioo H									
	Artificial Containers		+	+						
	Wells, Barrow Pits		+	+						+
es	Springs, Seepages							+		
speci	Brackish Waterpools									
Larval Habitats of Culex Species	Marshes, Swamps									
to s	Tree Holes					+		+	(+)	
Habitat	Rock Holes,							+		
arval	Surface Pools, Ponds		+	+						+
	Stream Pools, Irrigation Ditches							*		#
	Rice Paddy									+
1										
		Culex (Lutzia)	fuscanus	halifaxii	Culex (Neoculex)	brevipalpis	Culex (Mochthogenes)	foliatus	khazani	malayi
		Cule			Cule		Cule			

Larval Habitats of Culex Species	Surface Pools, Ponds Rock Holes, Pools Asrahes, Swamps Brackish Waterpools Springs, Seepages		(+)	+		+ +	+ +	+	+	+
	Rice Paddy Stream Pools, Irrigation Ditches			+		+		+	-	+
		Julex (Lophoceraomyia)	bernardi	cinctellus	curtipalpis	infantulus	minor	minutissimus	quadripalpis	rubithoracis

			Larva	Larval Habitats of Culex Species	ats of	Cul	ex Spe	cies					
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			. '£				: er bc			ntain		pou.	əwy
	ф	eloo9 id u	Pools	'səŢ	gəŢ	•	r Wa		sjiq	rJ Coi		Inter	Cato
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	Rice		Pon	Poor Poor	элТ				Mel	itaA		Bsn Stur	D oll
Culex (Culiciomyia)													
fragilis	14			+	+					*	+		
nigropunctatus	*	+	+	+		+		+			+	+	
pallidothorax	+ : '^.'	+	#	+ +			-	+		+	+	+	-
viridiventer		, + : .	, a, es		+		18 1 T						
Culex (Culex)		v ^{er}											
annulus	+	+	+				+		+			+	
bitaeniorhynchus	+		*										

		Ä	Larval Habitats of Culex Species	abitat	s of C	ulex	Spec	ies				
	Rice Paddy	Stream Pools, Irrigation Ditches	Surface Pools, Ponds	Pools Rock Holes,	Tree Holes	Marshes, Swamps	Brackish Waterpools	Springs, Seepages	Wells, Barrow Pits	Artificial Containers	Footprint, Hoodprint	Bamboo Internodes, Stumps
fuscocephala	+		#						+			
gelidus	+	+	#							+		
hutchinsoni		 . + .	, * ,	+							+	
mimeticus		+	#									
mimulus		+	#	. +		+	•		+		+	+
pipiens quinquefasciatus			+						+	+		
pseudosinensis		(+)										
pseudovishnui	+	+	#		•				+			
sinensis	+	+	#									

Polluted Catchments

Bamboo Internodes,

Stumps

	Footprint, Hootprint						
	Artificial Containers	+					
	Wells, Barrow Pits		+	+	+	+	
8	Springs, Seepages		+				
pecie	Brackish Waterpools	#					
Culex S	Marshes, Swamps		+				
Larval Habitats of Culex Species	Tree Holes						
	Bools Bock Holes,						
arval l	Surface Pools,		*	#	+	*	+
H	Stream Poola, Irrigation Ditches		+	+	+	+	+
	Rice Paddy		+		+		+
		sitiens	tritaeniorhynchus	vagans	vishnui	whitei	whitmorei
		11					

· Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia.

'Particularly favored larval habitat. +) Only larval habitat known.

Culex of Medical Importance

Within the genus Culex, only three species are presently recognized as established vectors of disease organisms in South East Asia. C. (Culex) tritaeniorhynchus (sensu lat.) and C. (Culex) gelidus are important vectors of Japanese B encephalitis, and C. pipiens guinguefasciatus is the most important vector of bancroftian filariasis wherever the disease occurs. Several other species of the genus have been incriminated as disease vectors, but their efficiency as natural vectors is either insignificant or has not been adequately studied to permit definite conclusions. Included among these are C. (Lutzia) fuscanus from which Brugia malayi has been isolated; C. (Culiciomyia) spathifurca and C. (Culiciomyia) pallidothorax which have been experimentally infected with Wuchereria bancrofti; C. (Culex) bitaeniorhynchus, a suspected vector of the encephalitides and Wuchereria bancrofti; and C. (Culex) pipiens quinquefasciatus from which has been isolated chichungunya and eastern equine encephalitis viruses in Thailand. Bakau, Ketapang, and Bebaru viruses have been isolated from species of the subgenus Lophoceraomyia but little is known about the ecology of either the vectors or the viruses.

C. tritaeniorhynchus (sensu lat.), gelidus, and pipiens quinquefasciatus are all probably distributed throughout Vietnam and each is capable of maintaining high population densities. Larvae of tritaeniorhynchus (sensu lat.) are found in a variety of temporary and semipermanent ground water habitats and almost any sunlit permanent freshwater pond, containing some vegetation is particularly favorable. Adults feed primarily on cow and pig, but will feed on man in the absence of cattle; in the presence of cattle, man is apparently almost completely ignored. Larvae of gelidus may be found in habitats similar to those of tritaeniorhynchus (sensu lat.). Adults commonly feed on large domestic animals, but will also feed on man in the absence of a suitable host. Larvae of pipiens quinquefasciatus are generally found in highly polluted waters, particularly in urban environments. Adults feed on a variety of hosts but will readily attack man both in and out of doors.

KEY TO AEDES ADULT FEMALES

1.	Scutellar scales narrow
	Scutellar scales broad and flat, or mostly so
2(1).	Lower mesepimeral bristles absent
	Lower mesepimeral bristles present (mesonotum marked with golden scales along lateral margin)
	(Neomelanoconion) lineatopennis
3(2).	Mesonotum and scutellum with golden scales; paratergite with scales or bare
	Mesonotum and scutellum largely dark; paratergite bare
4(3).	Wing and femur speckled; tarsi banded; paratergite with
-(-,-	scales; proboscis long and slender, much longer than front femur (Ochlerotatus) vigilax
	Wing and femur not speckled; paratergite bare; proboscis shorter than, to about equal in length to, front femur
5(4).	Mesonotum dark, with a narrow longitudinal golden stripe; tarsomeres dark; abdominal terga dark
	(Paraedes) ostentatio Mesonotum with golden scales but not forming definite pattern; tarsomeres banded; abdominal terga with narrow basal bands(Neomelanoconion) imprimens
6(3).	Abdominal terga with pale lateral markings Abdominal terga dark, sometimes with indefinite pale markings(Aedes) dux
7(6).	Metameron with fine hairs andamanensis Metameron bare (Verralina) butleri
8(1).	Paratergite bare; lower mesepimeral bristles absent;

Pleuron bare except for a small patch of scales on lower sternopleuron; alula with fringe of narrow scales; first hind tarsomere as long as or longer than tibia
Pleuron with patches of broad scales; alula with broad scales in addition to fringe scales; first hind tarsomere shorter than tibia(Skusea) amesii Wing membrane darkened around cross veins and base of R2+3; scutellum with tufts of twisted, white sub-erect scales; 8-10 lower mesepimeral bristles present (Mucidus) laniger Wing membrane and scutellar scales not as above; no lower mesepimeral bristles except in (Stegomyia) vittatus and (Christophersiomyia) brayi
R2+3; scutellum with tufts of twisted, white sub-erect scales; 8-10 lower mesepimeral bristles present (Mucidus) laniger Wing membrane and scutellar scales not as above; no lower mesepimeral bristles except in (Stegomyia) vittatus and (Christophersiomyia) brayi
Wing membrane and scutellar scales not as above; no lower mesepimeral bristles except in (Stegomyia) vittatus and (Christophersiomyia) brayi 11 At least one lower mesepimeral bristle present, and with
mesepimeron(Christophersiomyia) brayi
No lower mesepimeral bristle (except in Stegomyia vittatus); often with well defined white or yellow markings on mesonotum12
All scales on vertex and scutellum broad and flat; mesonotum nearly always with marked pattern of dark and white scales; tarsi conspicuously banded; paratergite with scales (Stegomyia)
wo subgenera may be separated on the basis of male ters as follows:
Palpus always longer than proboscis, with numerous long hairs laterally and apically on distal portion of segment III and all along IV-V; genitalia with claspettes absent; aedeagus divided into 2 lateral plates, each bearing several teeth(Aedimorphus) Palpus from 3/4 the length of proboscis to exceeding it by the length of terminal segment, with only few hairs at apices of segments III-V; genitalia with claspettes

13(12).	Mesonotum with lyre-shaped markings; clypeus with patches of white scales (Stegomyia) aegypti Mesonotum marked otherwise; clypeus bare (except in
	vittatus)14
14(13).	Tibiae with white bands near middle 15 Tibiae dark 16
15(14).	Mesonotum with 4-6 small, white spots; femur with preapical white bands; proboscis with scattered pale scalesvittatus
	Mesonotum with a pair of longitudinal white stripes on anterior half; femur with white bands; proboscis entirely darkdesmotes
16(14).	Palp entirely dark; mesonotum with a short longitudinal white stripe in front; hind tarsomeres IV-V dark albolineatus
	Palp white tipped; mesonotal markings otherwise17
17(16).	Mesonotum with a longitudinal white stripe for most of its length
18(17).	Abdominal terga with basal white bands and lateral white patches19 Abdominal terga dark dorsally, with white basal lateral patches only subalbopictus
19(18).	Scutellum with white scales on midlobe, dark laterally; hind tarsomere III dark, IV-V white mediopunctatus perplexus
	Scutellar lobes all white scaled; hind tarsomeres III-IV white at basal 1/2, V all whitealbopictus* pseudoalbopictus*
¥m1	The way has a woneted on the bodic of monitolic characters
as foll	
	Apical appendage of distimere subterminalpseudoalbopictus
<u>:</u>	Apical appendage of distimere terminal albopictus

20(17).	Mesonotum with a large anterior white patch; scutellar scales dark on mid lobe, white laterallyannandalei Mesonotum with a small round spot; scutellar lobes all white scaled edwardsi
21(12).	Wing spotted with pale and dark scales; femur and tibia spotted and banded with pale scales(Finlaya) poicilius Not this combination of characters22
22(21).	Hind tarsomere entirely darkniveus* niveoides* Hind tarsomere with pale markings23
23(22).	Mesonotal pattern usually consisting of narrow lines of white and yellow scales24 Mesonotal pattern varied usually consisting of patches of white scales29
24(23).	Femur with longitudinal white lines; also one or more of the tibiae lined anteriorly with pale scales 25 Femur and tibia otherwise 28
25(24).	Abdominal terga II-VI with a pair of pale spots; proboscis dark, middle half with pale scales beneath and sides, dark beneath for distal 1/4macfarlanei Abdominal terga II-VII with narrow pale basal bands, sometimes not visible dorsally
26(25).	Proboscis entirely darksaxicola Proboscis with pale scales27
27(26).	Paratergite and sub-spiracular areas with broad white scales; prealar scale patch separated from upper sternopleural scale patch; proboscis with ventral and lateral pale scales but not dorsally
	nales may be separated on the basis of characters of the ia as follows: Dorsal basal portion of basimere with a group of specialized scalesniveus Dorsal basal portion of basimere with a group of long setaeniveoides

	Paratergite and sub-spiracular areas bare; prealar scale patch continuous with upper sternopleural scale patch; proboscis with ventral pale area broadly produced onto dorsum chrysolineatus
28(24).	Mesonotal lines of white or creamy scales; proboscis dark, with some pale scales on upper surface on basal 1/4pseudotaeniatus Mesonotal lines of yellowish scales; proboscis dark on upper surface, with pale scales at sides and middleelsiae
29(23).	Abdominal sterna with long, outstanding scale tufts 30 Abdominal sterna without outstanding scale tufts gubernatoris
3 0(29).	Posterior pronotal area barekhazani Posterior pronotal area with white scale patch31
31(30).	Scutellar scales mainly white 32 Scutellar scales dark on all lobesfeegradei
32(31).	Mesonotal white scales usually extending posteriorly to prescutellar area assamensis Mesonotal white scales confined to anterior half, or may extend to prescutellar area in male prominens
33(12).	Hind tarsomere entirely dark; scutellar scales broad or narrow34 Hind tarsomere banded; scutellar scales mainly narrow 35
34(33).	Wing with a white spot at base of costa; abdomen with lateral basal white patches on terga (Aedimorphus) alboscutellatus
	Wing dark; abdomen with yellowish stripes laterally; fore and mid tibiae almost all yellowishniveoscutellum

35(33).	Wing and femur speckled; mesonotum with numerous
• •	pale scales evenly distributed; scales on mid lobe of
	scutellum narrowtaeniorhynchoides
	Wing not speckled; femur dark or with pale scales;
	scutellar scales narrow or lanceolate36

36(35). Femur speckled with pale scales anteriorly; scutellar scales golden, narrow and curved ----- vexans Femur dark anteriorly, pale beneath; scutellar scales whitish, mostly lanceolate and flat ----- caecus

The following four species are omitted because of lack of specimens:

Aedes (Aedimorphus) mediolineatus
Aedes (Aedimorphus) alongi
Aedes (Aedimorphus) tonkinensis
Aedes (Stegomyia) indosinensis

KEY TO AEDES LARVAE

1.	Abdominal segment VIII with a semicircular sclerofized plate on each side, from posterior margin of which the comb scales arise2
	Abdominal segment VIII without lateral sclerotized plate 4
2(1).	Comb of three to five scales with strong basal lateral denticles; two to eight pecten teeth; ventral brush of eight single long hairs(Stegomyia) desmotes Comb of five scales without basal denticles3
3(2).	Pecten teeth without denticles (Siphon hair tuft of two to three fine branches; anal hair 1 (lateral hair) of two subplumose branches — these characters are doubtful)————————————————————————————————————
4(1).	Thorax with two pairs of large, black spines on dorsum; comb scales in a patch5 Thorax without such spines6
5(4).	Siphonal hair-tuft modified into a stout spinulose bristle which may be bifid(Finlaya) elsiae Siphonal hair-tuft of four subplumose branches macfarlanei
6(4).	Head hairs 4-6 placed well forward anterior to level of bases of antennapseudotaeniatus Head hairs 4-6 mostly placed below level of bases of antenna
7(6).	Siphon with a ring of spines near apex and a median patch of similar spines on the anterior surface (Aedimorphus) caecus

	Siphon without apical spines
8(7).	Comb of five to nineteen large scales in a single, straight or irregular row, or more or less in two rows9 Comb of twenty to seventy scales, usually small, arranged in several rows or more or less in a triangular patch
9(8).	Antennal shaft with fairly numerous spicules or spines; basal pecten teeth with lateral denticles10 Antennal shaft smooth or with an occasional spicule15
10(9).	The two or three distal pecten teeth more widely spaced than those near base, and usually larger than basal teeth
11(10).	Head hairs 6 and 5 both with several branches
12(11).	All pecten teeth with lateral denticles, except most distal tooth in some individuals; head hair 7 with eight to thirteen branches, 6 with three to six, 5 with four to seven(Neomelaniconion) lineatopennis The most distal two or three pecten teeth without lateral denticles
13(12).	Anal hair 3 with three to five branches; mentum with twenty to twenty-four lateral teethimprimens Anal hair 3 single; mentum with eleven to sixteen lateral teeth(Aedimorphus) vexans
14(10).	Comb of sixteen to nineteen scales, each with fringe from base to apex; siphonal index 2.5:1(Finlaya) niveus Comb of eight to twelve scales, each fringed not more than half-way from base to apex; siphonal index 5:1niveoides

15(9).	rank and placed between hair tuft and apex of siphon(Stegomyia) vittatus
	Pecten teeth all one rank, none widely separated, or if distal tooth somewhat separated, not so placed16
16(15).	Ventral brush of ten tufts or less17
_ (_ , ,	Ventral brush of twelve to seventeen tufts 20
17(16).	with ten to twenty-five branches
	(Stegomyia) albolineatus
	Head hair 5 with one to two branches; head hair 12 with
	two to five branches 18
18(17).	Comb scales with prominent basal lateral spines; meso-
(,-	and metathoracic pleural hair groups each with a strong
	curved basal spine aegypti
	Comb scales without prominent basal lateral spines;
	spinulose at base; meso- and metathoracic pleural hair
	groups with weak basal spines 19
19(18).	Saddle minutely spinose along margin; about 8-16 pecten
	teeth with few strong denticles on one side at base only;
	8-12 comb scales presentalbopictus
	Saddle smooth; about 4-8 pecten teeth with small, fine
	lateral denticles; 6-8 comb scalespseudalbopictus
20(16).	Comb scales with complete apical fringe, no prominent
	terminal spine; abdominal hair 2-VIII with four to
	six branches(Verrallina) butleri
	Comb scales with a distinct terminal spine; abdominal
-	hair 2-VIII with one to three branches(Aedes) dux
21(8).	Head hairs 5, 6, and 7 simple, 4 minute, three to four
	branched, 5 moderately elongate; abdominal hair 3-VIII
	six to fourteen branched; siphonal tuft six to eight
	branched (Finlaya) prominens Not as above 22
	Not as above 22

22(21).	denticles or fringe, and usually larger than the basal teeth 23
	All pecten teeth with lateral denticles or fringed, and usually about same size (delicate ventral fringe difficult to see in amesii)25
23(22).	Thoracic hair 7-T with three to four strong almost spine- like and barbed branches; four to five single pecten teeth between hair tuft and apex of siphonsaxicola Thoracic hair 7-T not unusually developed; at most three single pecten teeth beyond tuft24
24(23).	Pecten of sixteen to nineteen teeth, two simple ones beyond tuft; anal hair 1 (lateral hair) three to four branchedchrysolineatus Pecten of about ten teeth, one or two simple ones beyond tuft; anal hair 1 (lateral hair) singleformosensis
25(22).	Siphonal tuft near apical 1/6 of siphon and of three to four long branches; antennal tuft of four to seven branches(Rhinoskusea) longirostris Siphonal tuft usually not more than 2/3 of length of siphon from base
26(25).	Pecten teeth about twelve or less, broad and fringed on one side (sometimes thirteen in (F.) poicilius), or long with very attenuate apex and toothed basally27 Pecten teeth nearly always more than twelve and not as above28
27(26).	Comb scales about seventy, those in distal row much larger and with a pair of large lateral denticles near base, apical portion expanded, very pale and with a delicate fringe; abdominal hair 3-VIII with five subplumose branches(Finlaya) poicilius Comb scales eighteen to twenty-eight in several rows, each with a delicate apical fringe without lateral denticles, apex attenuate; abdominal hair 3-VIII with twelve subplumose branches(Ochlerotatus) vigilax

28(26).	Head hairs 4, 5, 6, and 7 all placed well forward; 7 anterior to base of antenna with eight to fourteen slightly plumose branches, 6 about level of antennal base, single, 5 double (rarely triple), 4 slightly posterior to 5 and six to ten branched(Skusea) amesii Head hairs not as above
29(28).	Head hairs 5 and 6 usually single and standing one in front of the other30 Head hair 5 with three to four branches; 6 with two or four branches, anterolaterad of 5; antennal tuft with seven to nine plumose hairs (Aedimorphus) alboscutellatus
30(29).	Head hair 1 comparatively stout and blunt apically 31 Head hair 1 inconspicuous, rather long and tapering to a fine point; comb with thirty to forty scales, apically blunt and ending in a number of teeth; pecten of fourteen to seventeen teeth, each with two basal denticles, the lower one may be quite small(Finlaya) gubernatoris
31(30).	Head hair 4 nearer to hair 5 than to hair 6 32 Head hairs 4, 5, and 6 nearly in a straight line and separated by fairly even intervals; anal hair 2 of three to six long fine branches
32(31).	Anal hair 2 of about eight fairly long subequal branches————————————————————————————————————
	Larvae of the following species are not known. A. (Mucidus) laniger A. (Christophersiomyia) brayi A. (Stegomyia) edwardsi A. (Stegomyia) indosinensis A. (Stegomyia) subalbopictus A. (Aedimorphus) niveoscutellum

- A. (Aedimorphus) taeniorhynchoides
- A. (Paraedes) ostentatio
- A. (Aedes) andamanensis

The following three species are omitted because of lack of detail in the original larval description and absence of specimens.

- A. (Finlaya) alongi
- A. (Finlaya) tonkinensis
- A. (Aedimorphus) mediolineatus

	Ground Pools, Puddles	Leaf Axils	Rock Pools	Tree Holes, Stumps	Bamboo Stumps	Crab Holes	Artificial Containers	Marshy Ground Pools	Brackish Pools, Mangrove Swamps	Coconut Shells, Leaf Bases	Jungle Pools	
Aedes (Neomelanoconion)												
lineatopennis	(+)											
imprimens	+		+									
Aedes (Aedes)												
andamanensis	+											
dux	+											
Aedes (Verrallina)												
butleri									#			
Aedes (Paraedes)												
ostentatio											+	

	Jungle Pools								
	Coconut Shells, Leaf Bases						+		
	Brackish Pools, Mangrove Swamps		+		+				
cies	Marshy Ground Pools		+		+				(±
Spe	Artificial Containers					•			
edes	Crab Holes			٠	+				
Larval Habitats of Aedes Species	Bamboo Stumps								
	Tree Holes, Stumps						+		
val H	Rock Pools		+						
Lar	slixA 1s9.1						+		
	Ground Pools,								
		edes (Ochlerotatus)	vigilax	edes (Rhinoskusea)	longirostris	edes (Skusea)	amesii	edes (Mucidus)	laniger
		edes () sepe) sepe		edes (

									Coconnt Shells, Leaf Bases	
									Brackish Pools, Mangrove Swamps	
									Marshy Ground Pools	cies
					#				Artificial Containers	Spe
		. •							Crab Holes	edes
		+	+						Bsmboo Stumps	of A
. +	+	+							Tree Holes, Stumps	Larval Habitats of Aedes Species
+	+			(+)			*		Rock Pools	al Ha
									Leaf Axils	Larv
									Ground Pools, Puddles	
mediopunctatus perplexus	subalbopictus	albolineatus	desmotes	vittatus	aegypti	es (Stegomyia)	brayi	es (Christophersiomyia)		

Jungle Pools

	Brackish Pools, Mangrove Swamps
ies	Marshy Ground Pools
Species	Artificial Containers
Aedes	Crab Holes
io A	Bamboo Stumps
Larval Haditats	Leaf Axila Rock Poola Tree Holes, Stumps
La	Ground Pools, Puddles

Jungle Pools

Coconut Shells, Leaf Bases

	+	+						
				,				
Ì		`						
	+	+			+	*		
	+	+			+	+	#	(+)
				*				
	H							

pseudalbopictus

albopictus

*annandalei

*edwardsi poicilius

gubernatoris

niveoides

niveus

assamensis

മ	•
of Aedes	
Habitats	
Larval]	

	Jungle Pools									
Species	Coconut Shells, Leaf Bases				• •					
	Brackish Pools, Mangrove Swamps									
	Marshy Ground Pools									
s Spe	Artificial Containers						+	+		
Aede	Crab Holes									
of.	Bamboo Stumps					+	+		(+	
Larval Habitats of Aedes	Tree Holes, Stumps		+				+	+		*
val]	Rock Pools	#		#			. +	+		
Laı	Leaf Axils					+				
	Ground Pools, Puddles									
	e.									
		feegradei	macfarlanei	saxicola	tedes (Finlaya)	formosensis	chrysolineatus	pseudotaeniatus	elsiae	khazani
		1			¥e					

*prominens

	Jungle Pools		*	*		#
	Coconut Shells, Leaf Bases	·				
	Brackish Pools, Mangrove Swamps		+			
cies	Marshy Ground Pools					
s Spe	Artificial Containers					
Aede	Crab Holes					
of 7	Bamboo Stumps					
Larval Habitats of Aedes Species	Tree Holes, Stumps					· · · · · ·
val F	Rock Pools		+			
Lar	slixA lasd					
	Ground Pools, Puddles	#	+		#	
		alboscutellum	alboscutellatus	taeniorhynchoides	vexans	caecus

+ Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia.
Particularly favored larval habitat.
(+) Only larval habitat known.
* Larval habitat unknown.

Aedes of Medical Importance

The genus Aedes is of great importance because it includes vectors of yellow fever, dengue, the encephalitides and filariasis. Many species bite man readily, some during the day, others at night, and are among the worst pests of man. Strains of dengue and chikungunga viruses associated with epidemic hemorrhagic fevers of the Philippines and Thailand have been isolated from Aedes aegypti which is regarded as the natural vector in both countries. Aedes aegypti is found commonly breeding in a variety of artificial containers inside and outside houses in urban areas. Aedes albopictus is another proven vector of classical dengue. It is abundant in rural areas, often persistently biting man during the daytime, but occurs in comparatively low numbers in built-up areas. Aedes poicilius is the principal vector of bancroftian filariasis in the abaca growing areas of the Philippines. Adults bite severely at dusk and also during the daytime. They breed in water-filled axils of abaca, banana, aroid, taro, pandanus and pineapple plants. Aedes niveus is probably also a vector of bancroftian filariasis in the Philippines. It has been found naturally infected with mature third stage larvae of Wuchereria bancrofti. A. niveus is an out-of-door biter, and attacks man in the evening in banana groves, bamboo thickets and woods. Aedes vigilax in the Pacific is a potential vector of bancroftian filariasis, and potential vector in Fiji and neighboring islands. Also, the Murray valley encephalitis virus was isolated from this species in northern Queensland.

KEY TO TOXORHYNCHITES ADULT FEMALES

1.	Tarsomeres 3 to 5 of all legs with white markings or entirely white albipes One or more of tarsomeres 3-5 on fore or hind legs without white markings 2
2.	Abdominal segments VI-VIII with conspicuous lateral tufts of hairs splendens Abdominal segments without conspicuous lateral tufts of hairskempi
	KEY TO TOXORHYNCHITES LARVAE
1.	Mesothoracic dorso-lateral plate dividedalbipes Mesothoracic dorso-lateral plate not divided2
2.	Dorsolateral plate on abdominal segment VII with two bristles and three hairssplendens

Larval Habitats of Toxorhynchites Species

Dorsolateral plate on abdominal segment VII with one bristle and four hairs-----kempi

In containers, bamboo stumps, tree holes and similar situations.

KEY TO TRIPTEROIDES ADULT FEMALES

1.	Femora with silvery spots 2
	Femora without silvery spots (Rachionotomyia) aranoides
2(1).	Anterior pronotal lobe with broad, flat, silvery scales (Tripteroides) similis
	Anterior pronotal lobe with brown scales 3
3(2).	Posterior pronotal lobe with broad, flat, brown scales; mesonotal integument uniformly golden-brown proximus
	Posterior pronotal lobe with narrow brown scales; mesonotal integument with a pale U-shaped border anteriorlypowelli
	KEY TO TRIPTEROIDES LARVAE
1.	Abdominal segment VIII with plate bearing widely spaced comb scales (Rachionotomyia) aranoides Abdominal segment VIII without plate; comb scales closely set in a row
2.	Comb with sixteen to twenty-four scales, the dorsal ones sharply pointed and smooth, the ventral ones slender, blunt, and fringed (Tripteroides) powelli Comb with ten to fifteen very slender scales, the tips blunt and slightly fringedproximus

Larval Habitats of Tripteroides Species

In bamboo stumps, tree holes and similar situations. The larva of similis is not known.

KEY TO MALAYA ADULT FEMALES

Clypeus yellowish-white; a line of silvery scales between
eyesgenurostris
Clypeus dark; without a line of silvery scales between
eyesjacobsoni

KEY TO MALAYA LARVAE

All head hairs single, stout; comb with sixteen to twenty scales in 2 rows------jacobsoni Some head hairs double or triple; comb scales numerous, in 3 rows-----genurostris

Larval Habitat of Malaya Species

Larvae only known to occur in the leaf axils of certain plants.

KEY TO $\underline{\text{FICALBIA}}$ ADULT FEMALES

1.	Cell R ₂ only about half length of R_{2+3} 2 Cell R ₂ as long as or longer than R_{2+3} 3
2(1).	Tarsi with yellow rings; hind tarsomere 5 entirely yellow (Mimomyia) chamberlaini Tarsi not ringed; hind tarsomere 5 dark hybrida
3(1).	Tarsi with extensive pale areas; wings heavily speckled (Etorleptiomyia) luzonensis Tarsi dark except at joints; wings dark (Ficalbia) minima
	KEY TO <u>FICALBIA</u> LARVAE
1.	Pecten with one to three stout teeth; maxilla with a strong, black apical spine
2(1).	Antennal hair 1 near middle; head hair 1 simple; siphonal tuft near middle
3(2).	Siphon very short, broad at base but very narrow at tip; valves very small, without long hairs (Mimomyia) hybrida Siphon moderate in length, and with normal shape; valves large, each with a long fine hairchamberlaini
	•

Irrigation Ditches, Ponds, Water Tanks

Ground Pools with Pistia

Containers

chamberlainii

luzonensis

Ficalbia (Etorleptiomyia)

hybrida

Ficalbia (Ficalbia)

minima

+ Laryae recorded from this habitat in Vietnam or elsewhere in South East Asia.

KEY TO COQUILLETTIDIA ADULT FEMALES

Wing scales mainly dark; purplish scales on first four or five abdominal terga ----- crassipes Wing scales all yellow; abdomen yellow scaled---ochracea

KEY TO COQUILLETTIDIA LARVAE

Comb scales long, slender, sharply pointed ---- crassipes Comb scales not so slender, pectinate apically--- ochracea

Larval Habitats of Coquillettidia Species

The larvae of <u>crassipes</u> have been found attached to aquatic vegetation in open swamps and <u>ochracea</u> in Pandanus swamps.

KEY TO MANSONIA ADULT FEMALES

1.	Mesonotum marked with distinct round spots of white scales 2
	Mesonotum without distinct round white spots though there may be small indefinite white spots or patches3
2(1).	Mesonotum marked with 4 or more distinct round white spots; broad white scales on mid lobe of scutellum annulifera
	Mesonotum marked with 2 or 3 round white spots; narrow scales on mid lobe of scutellum dives
3(1).	Mesonotum marked with a pair of sublateral greenish stripes on a brown background uniformis
	Mesonotum all brown with no greenish stripes; some white scales may form indistinct white patchesindiana
	KEY TO MANSONIA LARVAE
1.	Antenna with basal 1/3 brown annulifera Antenna with only distinct brown band at base and at insertion of antennal hair 12
2(1).	Siphonal index at least 2:1indiana Siphonal index only about 1.6:13
3(2).	Anal segment wider at apex than at base dives Anal segment about same width throughout uniformis

Larval Habitats of Mansonia (Mansonioides) Species

With the exception of $\underline{\mathbf{M}}$. uniformis, which breeds in open swamps attached mainly to grasses, the rest are forest-swamp breeders and are to be found attached to rootlets.

Mansonia (Mansonioides) of Medical Importance

The subgenus Mansonia (Mansonioides) includes some species which are well known as vectors of filariasis due to Brugia malayi in Malaya, India, Ceylon and the Philippines. These are Mansonia dives, M. bonneae, M. annulata and to a lesser degree, M. uniformis. The latter is also regarded as an important vector of periodic Wuchereria bancrofti in Indonesia.

These mosquitoes attack man readily shortly after dusk both indoors and out of doors.

KEY TO URANOTAENIA ADULT FEMALES

1.	Hind tarsomeres 2-4 with white basal bandsedwardsi Hind tarsi entirely dark2
2(1).	Some white, creamy, or blue, flat broad scales along lateral margin of mesonotum in front of wing base3 No pale or blue, broad flat scales along margin of mesonotum, though there may be narrow pale scales
3(2).	Median pale markings on abdominal terga I-IV 5 No median pale markings on dorsum of abdomen-lateralis
4(2).	Mesonotum covered with a mixture of pale brown, ochreous, and dark brown scales macfarlanei Mesonotum covered with deep brown scales only campestris
5(3).	A line of bluish-white scales across pleuron, and a patch of rather broad greyish-brown scales above wing baseannandalei No line of bluish-white scales across pleuron, and no patch of greyish-brown scales above wing base6
6(5).	Abdomen with basal pale bands on one or more of the terga
7(6).	Bands well defined on all abdominal terga; no border of pale narrow scales around margin of mesonotum 8 Bands faintly indicated, but definite, on one or more terminal terga; a border of pale narrow scales from wing base around front of mesonotummaxima
8(7).	Pleuron uniformly paleluteola

	Pleuron with dark patches bicolor
9(6).	Some narrow pale scales on front or lateral margins of mesonotum10
	No pale scales on front or lateral margins of mesonotum11
10(9).	A large velvet black spot in front of each wing base bimaculata
	No large black spot in front of wing base maxima
11(9).	Pleuron with conspicuous dark markings on a pale back-groundmaculipleura Pleuron uniformly pale12
12(11).	Mesonotum light brown, often translucentrecondita Mesonotum dark brownobscura

<u>Uranotaenia hongayi</u> and <u>Uranotaenia lutescens</u> not included in the key.

KEY TO URANOTAENIA LARVAE

1.	Apex of comb scales rounded and fringedrecondita Comb scales with apical spine, lateral fringe may be present
2(1).	Pecten with twenty teeth or more bimaculata Pecten with less than twenty teeth 3
3(2).	Numerous strong stellate hairs on thorax and abdomen maxima
	Hairs on thorax and abdomen not strong and stellate 4
4(3).	Head hairs 5 and 6 very stout, resembling flattened leaf- like bristles5
	Head hairs 5 and 6 not flattened, resembling finely barbed bristleslateralis
5(4).	Plates of abdominal segment VIII connected dorsálly 6 Plates of abdominal segment VIII not connected dorsally7
6(5).	Antenna with three large leaf-like appendagesannandalei Antenna without large, leaf-like appendagesobscura
7(5).	Pecten with about fourteen teeth macfarlanei Pecten with about eleven teeth campestris
	Larvae of the following species have not been described: <u>Uranotaenia bicolor, U. edwardsi, U. luteola, U. maculipleura, U. hongayi, and U. lutescens.</u>

Species	sqmsw2 dsqiV
	Forest Streams
al Habitats of <u>Uranotaenia</u>	Crab Holes Tree Holes Tree Fern Stumps, Tree Fern Stumps Pools, Rock Pools, Puddles
Larval	

+ + + + +

macfarlanei

*edwardsi

Uranotaenia

lateralis

campestris

annandalei

maxima

*bicolor

*luteola

Species	
Uranotaenia	The second secon
4	
Habitats c	
Larval	

Forest Streams
Jungle Creeks, Shady Pools, Rock Pools, Puddles
Bamboo Stumps, Tree Fern Stumps
Tree Holes
Crap Holes

Mipah Swamps

*maculipleura recondita*obscura

bimaculata

Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia. Larval habitat unknown.

KEY TO ORTHOPODOMYIA ADULT FEMALES

- 1. Hind tarsomere 2 distinctly pale scaled at base on outer surface -----albipes Hind tarsomere 2 dark at base on outer surface -----2
- 2. Hind tarsomeres 3 and 4 each with a subapical black band;
 5 completely white -----anopheloides
 Hind tarsomeres 3-5 all pale scaled, or at most only 3
 with a subapical black band----- andamanensis

KEY TO ORTHOPODOMYIA LARVAE

- 1. Larger comb scales each consisting of a stout elongated spine with a fringe of short hairs laterally along the proximal portion-----albipes

 Larger comb scales each with a group of prominent elongate projections arising from an expanded apex----2
- 2. The siphonal hair tuft inserted at 0.32 0.42 the length of siphon from base -----andamanensis

 The siphonal hair tuft inserted at 0.42 0.5 the length of siphon from base----- anopheloides

Larval Habitats of Orthopodomyia Species

Larvae have been found in coconut shells, bamboo and other stumps, holes in trees and similar situations.

KEY TO HEIZMANNIA ADULT FEMALES

Abdominal terga with prominent baso-lateral white or
silver spots reidi
Abdominal terga with at most a few pale scales on
terminal segments complex

KEY TO HEIZMANNIA LARVAE

		simplecomplex	
Antennal hair	1	branchedreid	ī

Larval Habitat of Heizmannia Species

Larvae are usually found in holes in trees and bamboo stumps.

KEY TO ARMIGERES ADULT FEMALES

1.	Palpus not more than 1/3 length of proboscis (Subgenus Armigeres) 2
,	Palpus 1/2 or more the length of the proboscis (Subgenus Leicesteria)6
	Leicesteria)
2(1).	Sterna III-VI entirely white scaled (Armigeres) kuchingensis
	Sterna III-VI each with apical dark band3
3(2).	Mesonotum with a pair of submedian golden linesaureolineatus
	Mesonotum without a pair of submedian golden lines 4
4(3).	Sternum VII entirely dark moultoni Sternum VII with a narrow subapical white band 5
5(4).	Sterna III-VI with apical dark bands decreasing in width (1/2 of III; 1/3 of IV; 1/4 of V; 1/5 of VI) subalbatus Sterna III-VI with narrow, faint apical dark bands, or bands wider on III and IV than on V and VI durhami
6(1).	Postnotum with a tuft of minute setae (Leicesteria) flavus Postnotum bare7
7(6).	Terga with median basal yellow markings magnus Terga without median basal yellow markings8
8(7).	Hind tarsus with pale rings9 Hind tarsus dark, without pale rings10
9(8).	Clypeus scaled; palpus with white tip annulitarsis Clypeus bare; palpus all dark dolichocephalus
10(8).	Clypeus with flat elliptical scales longipalpis Clypeus bare, or only a few narrow scales11

KEY TO ARMIGERES LARVAE

1.	Comb scales fan-shaped, apically frayed 2 Comb scales with single apical point, either fringed or smooth 4
2(1).	Comb with five to six scales(Leicesteria) magnus Comb with ten or more scales3
3(2).	Comb with ten to twelve scalesflavus Comb with sixteen to twenty-six scales annulitarsis
4(1).	Comb with about seventy scales in a triangular patch longipalpis
	Comb with less than fifty scales in an irregular row 5
5(4).	Abdominal segments I-V with prominent, lightly sclerotized tubercles at base of setae
6(5).	Abdominal hair 5-VIII finely branched dolichocephalus Abdominal hair 5-VIII stout, single, or bifid pectinatus
7(5).	Lateral hair of anal segment simple, stout, as long as length of saddle, and inserted posteroventrally within saddle(Armigeres) kuchingensis Lateral hair of anal segment multiple, minute, and arising outside of saddle
8(7).	Head hairs 5 and 6 separated by twice the distance between hairs 4 and 6
9(8).	Head hair 5 minute, double or triplesubalbatus Head hair 5 prominent, with three to five branches aureolineatus

 $\frac{\text{Armigeres}}{\text{included in the key.}} \, \frac{\text{moultoni}}{\text{and }} \, \frac{\text{Armigeres}}{\text{cingulatus}} \, \, \text{are not}$

La	rval Hab	itats	of A	Larval Habitats of Armigeres Species	Spec	ies		
	Coconut Shells, Fallen Leaf Axils	Bamboo Stumps	у у	Artificial Containers Flower Cups of Parasitic Vine	Grassy Puddles	Tree Holes, Stumps	Tree Fern Stumps	
rmigeres (Armigeres)								
kuchingensis	+	+	·	+				
durhami					+	+		
subalbatus	+	•	+	+		+		
*aureolineatus								
malayi	+	+		+		+		
rmigeres (Leicesteria)								
magnus		+				+		

Tree Holes, Stumps
Grassy Puddles
Flower Cups of Parasitic Vine
Artificial Containers
Кос к Нодея
Bamboo Stumps
Coconut Shells, Fallen Leaf Axils

Tree Fern Stumps

E E 4 H \mathbf{B}

Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia. Larval habitat unknown.

*dolichocephalus

*pectinatus

annulitarsis

flavus

*longipalpis

LIST OF ILLUSTRATIONS

Plate I

- 1. Generalized adult female, lateral aspect.
- 2. Enlarged lateral aspect of the thorax showing bristles.
- 3. Enlarged lateral aspect of the thorax showing scales.
- 4. Enlarged dorsal aspect of the thorax showing bristles.

Plate II

- 5. Generalized wing showing dorsal wing venation.
- 6. Dorsal aspect of Anopheles wing illustrating the wing spots.
- 7. Lateral aspect of head and proboscis of Malaya jacobsoni.
- 8. Lateral aspect of the hind femur and tibia of Aedeomyia catasticta.
- 9. Apical flagellomeres of Aedeomyia catasticta.
- 10. Dorsal plume scales of Hodgesia malayi.
- 11. Tarsal claws and pulvilli of Culex sp.
- 12. Dorsal wing scales of Mansonia uniformis.
- 13. Lateral aspect of head and proboscis of Armigeres subalbatus.
- 14. Frontal aspect of the head of <u>Anopheles</u> <u>bengalensis</u> showing vertical head scales.
- 15. Hind tarsus of Anopheles nigerrimus.

Plate III

- 16. Generalized larva showing dorsal and ventral chaetotaxy.
- 17. Ventral aspect of a generalized larval head.
- 18. Dorsal aspect of a generalized mentum.
- 19. Terminal segments of a generalized larva.

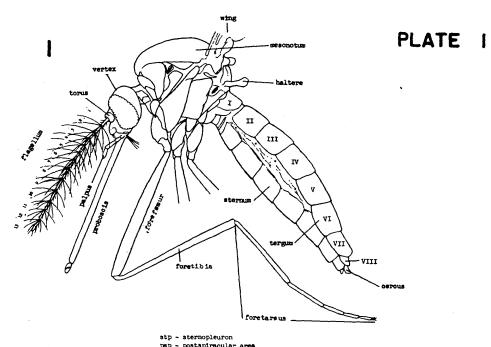
Plate IV

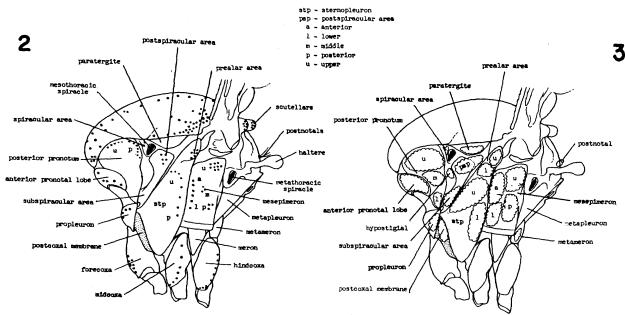
- 20. Hair types showing single and simple, single and barbed, stellate, plumose, pectinate, dendritic, and palmate.
- 21. Siphon of Mansonia uniformis.
- 22. Dorsal aspect of the thorax of <u>Tripteroides aranoides</u> showing prominent metathoracic spines arising from sclerotized bases.
- 23. Dorsal aspect of the thorax of <u>Topomyia gracilis</u> showing the sclerotized bases of the thoracic pleural groups.
- 24. Dorsal aspect of the buccal structures of <u>Culex</u> (<u>Lutzia</u>) fuscanus.

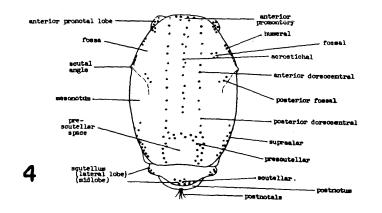
Plate V

- 25. Dorsal view of head of an Anopheles larva.
- 26. Dorsal view of fourth abdominal segment of an Anopheles larva.
- 27. Anterior surface of hind femur of <u>Culex pseudovishnui</u>.
- Ventral surface of proboscis of <u>Culex</u> tritaeniorhynchus showing accessory pale patches.

- 29. Dorsal and ventral views of thoracic region of an Anopheles larva.
- 30. Dorsal view of the male terminalia of a <u>Culex</u> subgenus Lophoceraomyia.
- 31. Lateral view of terminal segments of an Anopheles larva.
- 32. Dorsal view of male terminalia of an Aedes.







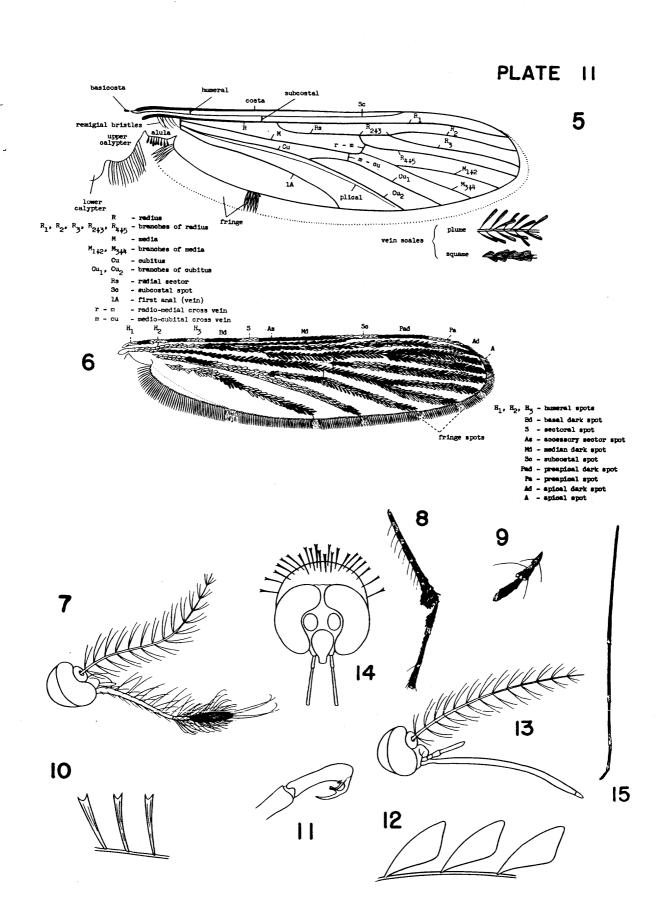


PLATE III

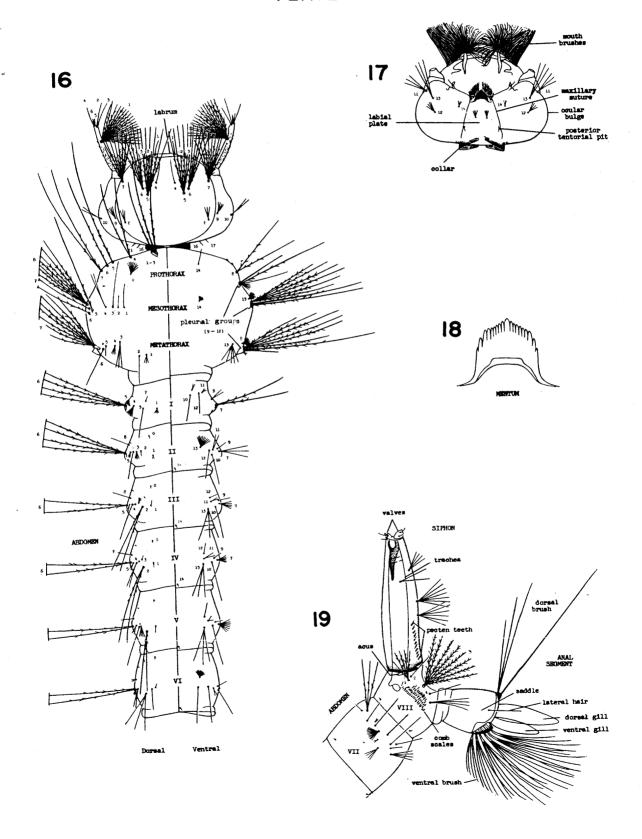


PLATE IV

